CLAIMS

What is claimed is:

1. A drive axle assembly (10), comprising:

a carrier (24);

a differential case (22) rotatably disposed in said carrier (24);

a pair of axle shafts (14, 16) disposed within said differential case (22) and rotatable relative to each other about an axis (A);

a drive hub (78) disposed about one of said axle shafts (14, 16);

a plurality of friction discs (74, 76) adjacent one another in an alternating relationship defining a running clearance therebetween and disposed within and alternatively connected to said differential case (22) and said drive hub (78);

a plurality of levers (104) extending radially relative to said axis (A) between a radially inward end (114) to a radially outward end (116) and engaging said friction discs (74, 76);

an actuator assembly (84) disposed about one of said axle shafts (14, 16) for engaging said levers (104) to force said levers (104) into engagement with said friction discs (74, 76) for forcing said friction discs (74, 76) into engagement with one another for transmitting torque between one of said axle shafts (14, 16) and said differential case (22); and

each of said plurality of levers (104) characterized by said radially inward end (114) engaging said actuator assembly (84) and said radially outward end (116) engaging said differential case (22) having a disc engaging portion (118) between said radially inward (114) and outward (116) ends for engaging said friction discs (74, 76) between said radially inward (114) and outward (116) ends thereof for amplifying a thrust force applied by said actuator assembly (84) by pivoting about the engagement of said radially outward end (116) with said differential case (22) in response to axial movement of said radially inward end (114) by said actuator assembly (84).

2. A drive axle assembly (10) as set forth in claim 1 wherein each of said levers (104) includes an elongated portion (120) extending between said radially inward end (114) and said disc engaging portion (118) with a length of said elongated portion (120) defining a degree of amplification of the thrust force.

3. A drive axle assembly (10) as set forth in claim 2 wherein said disc engaging portion (118) is generally V-shaped.

4. A drive axle assembly (10) as set forth in claim 3 wherein said actuator assembly (84) includes a sleeve (100) movable axially and having first (106) and second (108) ends with said first end (106) defining a lip (110) and said second end (108) engaging said radially inward end (114) of said levers (104).

5. A drive axle assembly (10) as set forth in claim 4 wherein said levers (104) are interconnected one with another by a link to form a plate (102).

6. A drive axle assembly (10) as set forth in claim 5 wherein said levers (104) of said plate (102) define a generally octagonal configuration.

7. A drive axle assembly (10) as set forth in claim 2 wherein said radially outward end (116) slopes downwardly to said disc engaging portion (118) and then upwardly through a peak (124) to said elongated portion (120).

8. A drive axle assembly (10) as set forth in claim 4 wherein said sleeve (100) and said levers (104) rotate about said axis (A) with said differential case (22) and at least one of said axle shafts (14, 16).

9. A drive axle assembly (10) as set forth in claim 8 further including a pressure plate (80) disposed annularly about said axis (A) between said disc engaging portion (118)

and said friction discs (74, 76).

10. A drive axle assembly (10) as set forth in claim 1 including a piston housing (88) circumscribing at least one of said axle shafts (14, 16) and supported by said carrier (24).

11. A drive axle assembly (10) as set forth in claim 10 including a piston (90) disposed in said piston housing (88) defining a cavity (92) therebetween.

12. A drive axle assembly (10) as set forth in claim 12 wherein said piston (90) operably engages said sleeve (100) to provide the thrust force.

13. A drive axle assembly (10) as set forth in claim 12 wherein said actuator assembly (84) further includes a thrust bearing (112) coupled between said piston (90) and said sleeve (100) for isolating said piston (90) from said sleeve (100) such that any rotation of said sleeve(100) does not translate to said piston (90).

14. A drive axle assembly (10) as set forth in claim 13 including a hydraulic inlet (94) connected to said piston housing (88) for introducing a fluid into said cavity (92) for pressurizing said cavity (92) and forcing said piston (90) away from said piston housing (88).

15. A drive axle assembly (10) as set forth in claim 14 including an adjusting ring (86) operably connected to said carrier (24) and disposed annularly and stationary about one of said axle shafts (14, 16).

16. A drive axle assembly (10) as set forth in claim 1 including a ring gear (20) operably connected to said differential case (22) and rotatable about said axis (A).

17. A drive axle assembly (10) as set forth in claim 16 wherein said differential assembly (18) further includes a differential spider (26) presenting four support shafts (62, 64) orientated in the shape of a cross.

18. A drive axle assembly (10) as set forth in claim 17 wherein said differential assembly (18) further includes pinion gears (66) each supported for rotation on each of said support shafts (62, 64).

19. A drive axle assembly (10) as set forth in claim 18 wherein said differential assembly (18) further includes a pair of side gears (28, 30) presenting a meshing engagement with said pinion gears (66) and connected to each of said axle shafts (14, 16).

20. A differential assembly (18), comprising:

a differential case (22) rotatable about an axis (A);

a drive hub (78) disposed about said axis (A);

a plurality of friction discs (74, 76) adjacent one another in an alternating relationship defining a running clearance therebetween and disposed within and alternatively connected to said differential case (22) and said drive hub (78);

a plurality of levers (104) extending radially relative to said axis (A) between a radially inward end (114) to a radially outward end (116) and engaging said friction discs (74, 76);

an actuator assembly (84) disposed about said axis (A) for engaging said levers (104) to force said levers (104) into engagement with said friction discs (74, 76) for forcing said friction discs (74, 76) into engagement with one another for transmitting torque between said drive hub (78) and said differential case (22); and

each of said plurality of levers (104) characterized by said radially inward end (114) engaging said actuator assembly (84) and said radially outward end (116) engaging said differential case (22) having a disc engaging portion (118) between said radially inward (114) and outward (116) ends for engaging said friction discs (74, 76)

between said radially inward (114) and outward (116) ends thereof for amplifying a thrust force applied by said actuator assembly (84) by pivoting about the engagement of said radially outward end (116) with said differential case (22) in response to axial movement of said radially inward end (114) by said actuator assembly (84).

21. A differential assembly (18) as set forth in claim 20 wherein each of said levers (104) includes an elongated portion (120) extending between said radially inward end (114) and said disc engaging portion (118) with a length of said elongated portion (120) defining a degree of amplification of the thrust force.

22. A differential assembly (18) as set forth in claim 21 wherein said disc engaging portion (118) is generally V-shaped.

23. A differential assembly (18) as set forth in claim 22 wherein said actuator assembly (84) includes a sleeve (100) movable axially and having first (106) and second (108) ends with said first end (106) defining a lip (110) and said second end (108) engaging said radially inward end (114) of said levers (104).

24. A differential assembly (18) as set forth in claim 23 wherein said radially outward end (116) slopes downwardly to said disc engaging portion (118) and then upwardly through a peak (124) to said elongated portion (120).

25. A differential assembly (18) as set forth in claim 20 further including a pressure plate (80) disposed annularly about said axis (A) between said disc engaging portion (118) and said friction discs (74, 76).

26. A differential assembly (18) as set forth in claim 20 including a piston housing (88) and a piston (90) disposed in said piston housing (88) defining a cavity (92) therebetween.

27. A differential assembly (18) as set forth in claim 26 wherein said piston (90) operably engages said sleeve (100) to provide the thrust force.

28. A differential assembly (18) as set forth in claim 27 wherein said actuator assembly (84) further includes a thrust bearing (112) coupled between said piston (90) and said sleeve (100) for isolating said piston (90) from said sleeve (100).

29. A differential assembly (18) as set forth in claim 28 including a hydraulic inlet (94) connected to said piston housing (88) for introducing a fluid into said cavity (92) for pressurizing said cavity (92) and forcing said piston (90) away from said piston housing (88).

30. A differential assembly (18) as set forth in claim 20 further including a ring gear (20) operably connected to said differential case (22) and rotatable about said axis (A).

31. A differential assembly (18) as set forth in claim 30 further including a differential spider (26) presenting four support shafts (62, 64) orientated in the shape of a cross.

32. A differential assembly (18) as set forth in claim 31 further including pinion gears (66) each supported for rotation on each of said support shafts (62, 64).

33. A differential assembly (18) as set forth in claim 32 further including a pair of side gears (28, 30) presenting a meshing engagement with said pinion gears (66) and connected to each of said first (14) and second (16) axle shafts.